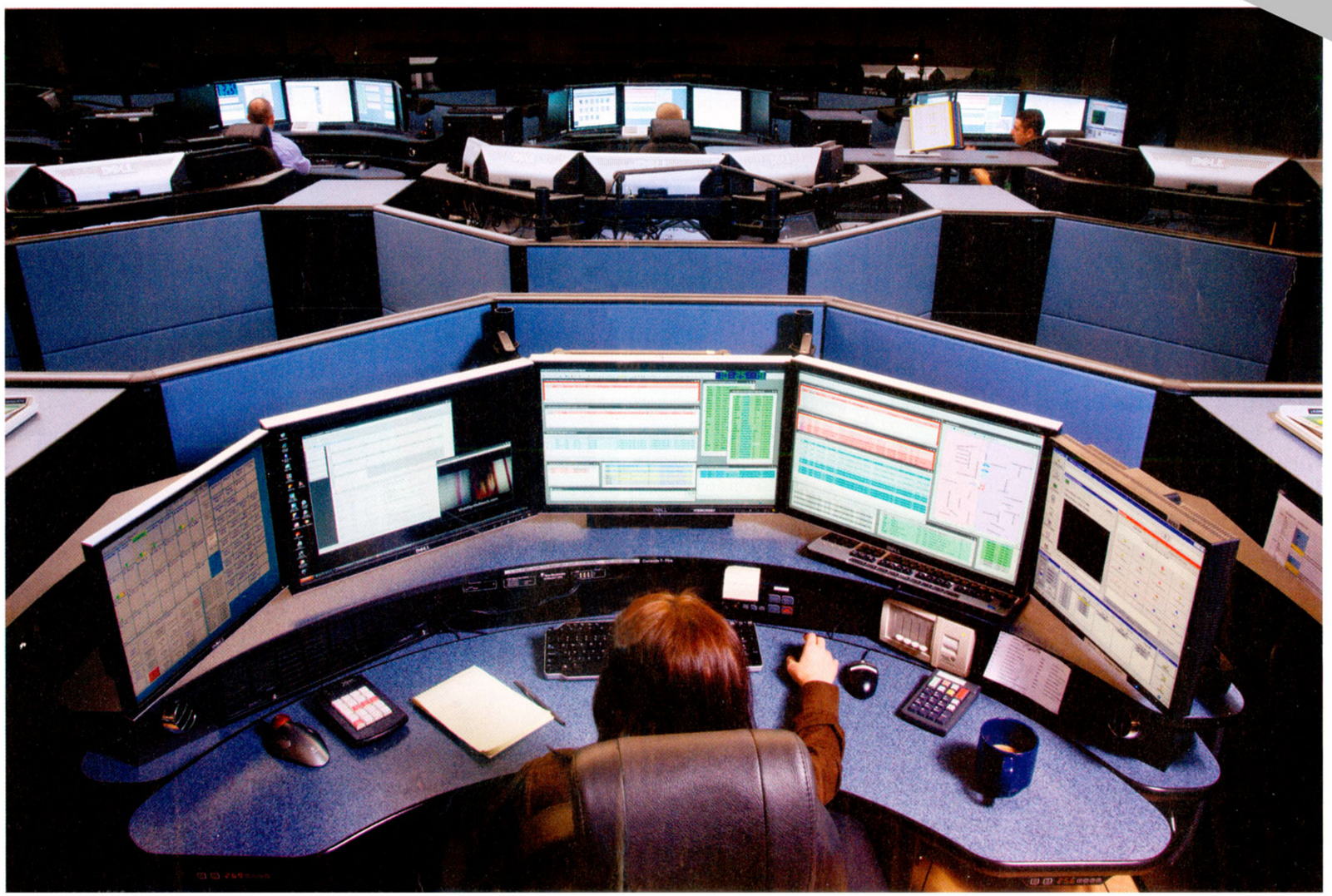
HOW TO FIX 911

The emergency network was designed for landlines. Land-*what?* Why our safety depends on modernizing 911 for the mobile age

BY CHRISTINE KENNEALLY



THE PHONE RANG AT 4:43 A.M. ON March 27, 2007. Patty Michaels, a dispatcher at a 911 call center in Belleville, Ill., picked up. On the other end, a woman screamed for help. She said her husband had attacked her. Michaels heard a baby crying in the background. The caller's address appeared on Michaels' screen: it was in O'Fallon, Ill., less than 10 miles away. Michaels asked the woman to confirm it. "That's when it got really tricky," she says. The caller wasn't in Illinois. She was in South Korea.

Two days earlier, the woman and her baby had left O'Fallon to join her husband, an Army serviceman posted in Seoul. She was locked in her bedroom, afraid for her life. But because the woman had dialed 911 from a VOIP—voice over Internet protocol—service, using a computer, Michaels had no way of finding her. The 911 system doesn't locate computers; it shows only the address that the phone service is registered to, and when Michaels' caller left the country, she didn't update her address.

That small lapse underlies the fundamental problem of 911: it was developed for landlines back in the days when copper wires ran between a telephone and a central switch. But since 1968, when the first 911 call, a ceremonial test case, rang in Haleyville, Ala., the service has grown to cover 96% of the U.S. and now receives some 240 million calls a year—less than half from landlines in many communities.

Americans assume we can connect to 911 in all the ways we connect to each other. Our GPS-enabled smart phone, Google and Foursquare may know exactly where we are at any given time, but unfortunately, these technologies aren't compatible with standard 911. Traditional emergency services don't take texts, photos, Skype calls or videos either. Then there are social media like Twitter and Facebook, which work when our phones don't. After the March 11 earthquake and tsunami in Japan, millions of people communicated through social networks when landlines went down and mobile networks were overwhelmed. Within an hour of the earthquake, more than 1,200 tweets a minute were coming from Tokyo, including video updates on the scene. But a system like 911—the first first responder—is out of the loop.

Such gaps leave us with a patchy emergency infrastructure that has become progressively less able to find people in need. After dispatcher Michaels accepted that the call coming from South Korea was no joke, she was stumped. She couldn't use GPS or subscriber information, and she couldn't access the local telephone carrier for help. Michaels could hear the woman's husband shouting from another room. "I was so afraid we'd be disconnected," she says. "Then we would never find her."

Holes in the Safety Net

IT TOOK 20 YEARS FROM THAT FIRST TEST call in 1968 for 911 to reach 50% of the U.S. population. In the beginning, dispatchers couldn't even tell where calls were coming from. Eventually, a set of fixes allowed a caller's phone number to be passed to the 911 center, where it was matched to a street address in the local telephone carrier's database. The upgrade meant that landlines excelled at caller location. Then phones went mobile.

As cell phones proliferated, old problems resurfaced—except worse. Because the location of cell phones shifts constantly, the "local" 911 call center may change for each call from a given phone. Typically, a call can be routed based on the location of the tower handling it. But depending on cellular traffic, that tower may not be the one physically nearest the caller. Recent solutions include using several towers to triangulate the source of a signal or homing in on the phone's GPS. But some call centers still don't have cellular-call location today, and even the best fixes aren't perfect: it's impossible to triangulate off a straight line of towers in rural America. As for GPS, it presents longitude and latitude, but 911 centers have no way of getting altitude, so they can't automatically find a caller in a high-rise.

In 2009, 25% of households used *only* a cell phone, according to government data, a trend that shows no signs of easing. But even as mobile-phone use rockets, it may be rivaled by that of the increasingly popular and cheaper Internet phone. Since the early 2000s, when VOIP phone services were commercialized, more than 21 million Americans have signed up. The problem for 911 is that Internet caller location is less reliable than cell-phone location. It *is* possible to locate an Internet phone, but service providers aren't obliged by the Federal Communications Commission (FCC) to add this feature, so they don't. Instead, they ask users to register their address, which is used to route 911 calls. But, like Michaels' caller, people often forget to change their address when they move.

Because so many phones are mobile, dispatchers now end up manually rerouting more calls between centers. And therein lies what is probably the most widely shared misconception about 911: that it is somehow networked. But "911" is a convention, not a system. More than 6,000 call centers in the U.S. are run independently by

HOW ONE COUNTY GOT IT RIGHT
The multimillion-dollar 911 call center at the Hamilton County, Indiana, sheriff's office has 24 state-of-the-art, computer-aided dispatch systems. Each operator sits in a plumped-up chair at an ergonomically designed desk on which five large screens simultaneously show call status, caller information, police-radio activity and other data—all of which can be shared instantly over radio, phone, Internet, dispatch and cellular systems.

Photographs by Floto+Warner for TIME

the relevant counties, cities and states. Each may serve a particular area or population—like California's highway patrol or a campus or airport—and their jurisdictions may or may not overlap. What's more, in most cases, if a call center is itself hit by an emergency like a hurricane, it doesn't have automatic backup. The phone just won't ring.

Now, led by the National Emergency Number Association (NENA), the FCC and various emergency-industry vendors, dramatic plans are under way to fix 911 by ripping out its underlying architecture. According to industry insiders like Nate Wilcox, chief technology officer of the 911 software supplier MicroData, the new 911 will roll out across the country over the next two to five years. At least 100 call centers are already testing various features. The new 911 will be an entirely new creature: an intelligent network of networks that will not just find you faster but also read your texts and watch your video at the same time that it may track threats to the entire nation.

The Next-Generation 911

IF YOU ABSOLUTELY HAD TO CALL 911, you'd be well placed to do it in Hamilton County, Indiana, where the sheriff's buildings in Noblesville recently underwent a multimillion-dollar upgrade.

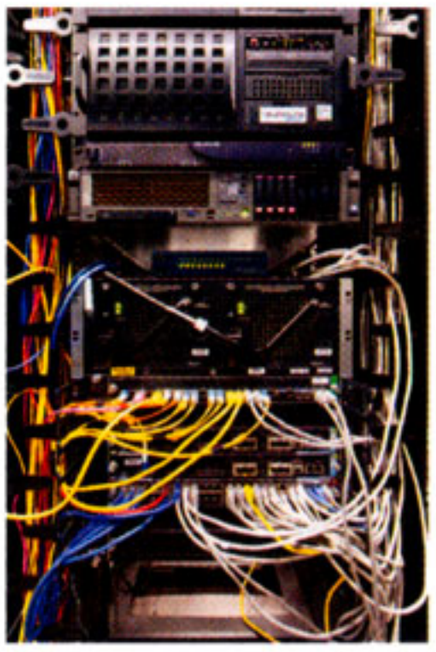
In the new call center (which boasts a noiseless vacuum cleaner because there is no good time to pull out the vacuum on the other end of 911), operators sit at one of 24 state-of-the-art, computer-aided dispatch systems. Each has five large screens showing call status, caller information, police-radio activity and other information. Here the old 911 system has been upgraded to an interconnected Internet protocol (IP) base. "Physical distances no longer are an issue," explains Jeremy Hunt, the Hamilton County sheriff's network administrator. "We can [give] a dispatcher across the county the same capabilities as a dispatcher in our building."

Not only does it connect all of its internal moving parts, but this new 911 also shares its network with local emergency services and with other call centers, creating a vast but nimble emergency network. That means the new 911 can respond to, or help prevent, problems on a national scale. Dispatchers could be the first line of information gathering in the event of a pandemic, for instance, or 911 data could be filtered to detect signs of terrorist activity.

This overhaul of the architecture also means that at any level, from caller to call center to emergency services, all data can be shared. Take maps: in Hamilton County, Brooke Gajownik's crucial duty is to "geocode" all information that comes in or goes out through 911—information that is constantly added to layers of maps on which dispatchers rely. So when a cell-phone call is received, emergency dispatchers first consult a standard street map. Then they look at additional digital map layers, such as those that give second looks at a location, like an oblique aerial shot, or show local landmarks that callers might recognize. They can also look at the names of residents mapped on a street. When a recent cell-phone call came in from a frightened babysitter who didn't know where she was, the dispatcher found her street location based on her longitude and latitude. She then ran through a map that showed household names: "Are you at the A. Jones house? Are you at the B. Smith house?" until the girl said, "That's it!"

Gajownik's maps in Hamilton County will eventually become part of the system itself, locating a caller even before the phone is answered. It will send the floor plans of a burning building to firefighters at the same time dispatchers notify them of the fire. Even callers will be able to use this kind of technology: if a caller has special needs, she may program her phone to send medical records to 911 automatically.

Next-generation systems receive texts, e-mail and instant messages, a feature that promises to help hearing- and speech-impaired individuals, among other victims. The new 911 also handles video and images; Europe's emergency 112 system does this already in the Murcia region of Spain. If you're calling from your 3G phone, the dispatcher can remotely switch on your smart phone's video camera and give you a simple directive: point your camera at the emergency. First responders watching the feed can then count the number of cars in a pileup, evaluate the intensity of a house fire or assess injuries to victims. In 2009 a similar system was tested in Washington, D.C., over the AT&T network and succeeded.



Why don't callers just tell 911 where they are? Many do, but others are so panicked, they can't. Or they're injured or hearing-impaired or lost, with no idea where they are

New Solutions, New Problems

"WHAT A LEAP IN PROGRESS IT WILL BE when a witness can take a photo of a car crash and send it to 911," FCC chairman Julius Genachowski said last June at an NENA conference. No doubt it will save lives. But what happens when 100 people do it?

Years ago, the average highway crash may have netted one 911 call from a driver who stopped to use a public phone. Today every driver on the road has a cell phone. When a bridge in Minnesota collapsed in 2007, more than 100 calls poured into 911 in the first two minutes. The state's 911 center was equipped to handle the spike, but if each of those calls had carried video, it's unclear if dispatchers could have identified the images that actually mattered. There will be other rough patches all over the country, as call centers learn to block Internet-based pranks and decode panicked texts. Network security against viruses and sabotage will be an issue too, especially if callers are uploading data like photos.

These next-generation challenges will be layered over a system that has some straightforwardly human problems. Everyone's heard the horror stories—dispatchers hanging up on callers or falling asleep and snoring during calls. In one case in Chattanooga, Tenn., more than 20 calls were missed because three of four dispatchers were taking a coffee break together.

But it's also worth remembering that no matter how advanced the technology, emergencies are best served by smart *people*—like Michaels in Belleville, Ill.—on the other end of the line. When Michaels tried to confirm her caller's South Korean location, the woman could tell her only an apartment number, the name of her building and that she was somewhere near the Yongsan Army garrison. So Michaels turned to an old technique. "Look out the window," she said. "Tell me what you see." She kept the woman on the line while opening a conference call with Scott Air Force Base, near Belleville. A sergeant there contacted the Yongsan base in Seoul, where personnel pinpointed their rogue soldier and called in the Korean national police. Eventually, Michaels heard her caller's intercom ring 10,000 miles away. "Are you the police?" the woman asked. They were. Forty-eight minutes after Michaels' phone rang, her caller—now safe—hung up. ■

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